Wild Grapevine *Vitis vinifera ssp. sylvestris* Gmel. in Georgia: Research and Preservation

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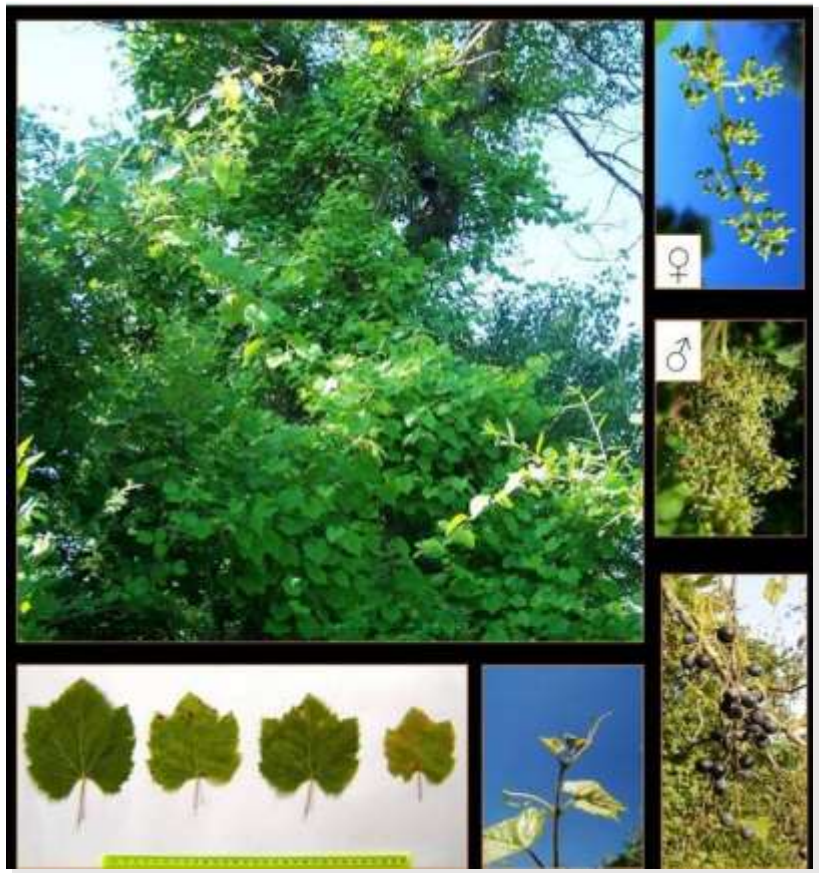
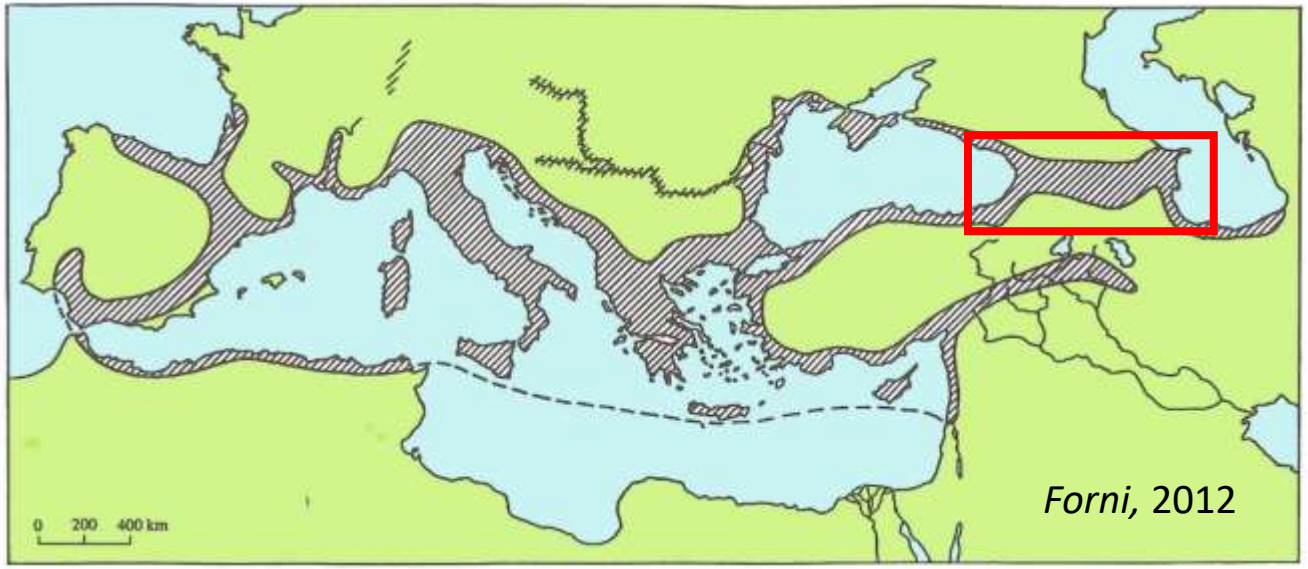
22 May. 2024. Tbilisi. Georgia

Background

Wild Grapevine *Vitis vinifera* ssp. *sylvestris* Gmel. and Georgia

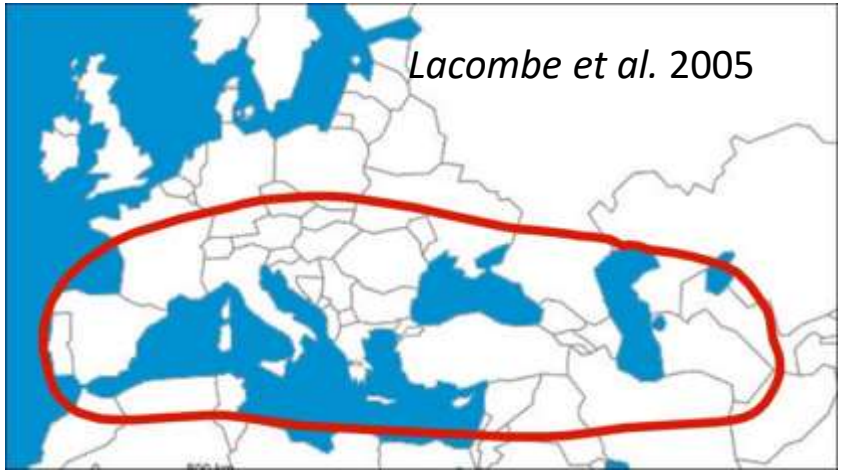


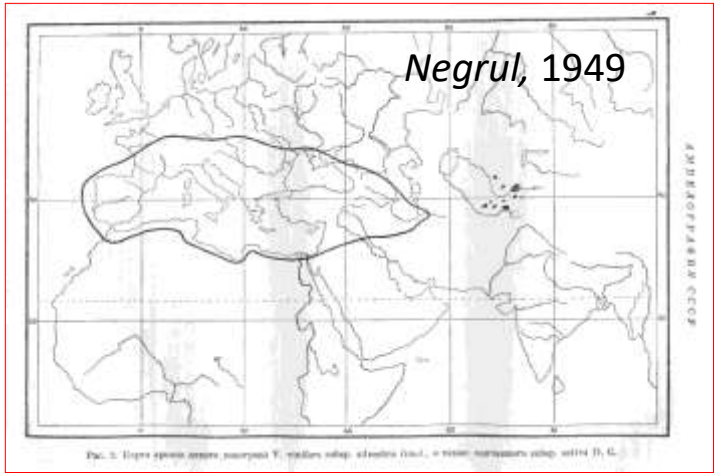
V. vinifera ssp. *sylvestris* (Gmelin) Hegi, a wild ancestor of the cultivated grapevine *V. vinifera* ssp. *sativa* D.C., is a typical representative of the Caucasus and Georgian flora.



It is a part of the Eurasian entire wild grapevine population.

This plant is spread in almost all woody regions, in forests on lowlands and rivers' banks up to 1200 m above sea level.





Background

Vitis vinifera ssp. *sylvestris* Gmel. in Georgia

Wild grapevine *V. vinifera* ssp. *silvestys* Gmel. it grows sporadically on the territory of the country recently .

But it was widely spread almost on all territory of the Country in past.

History

History in Brief

History of wild grapevine in Georgia should be divided in two periods:

1) since the earliest period until the second part of the 19th centuries, when there was the best conditions for growing of this plant here.

2) Since 60s of the 19th century until today when fungal diseases (Downy and Powdery Mildews), *Phylloxera* and plus expanded human activities, destroyed spontaneous development of wild grapevine populations.

Ramishvili 1988

The first researcher who started investigation and made systematization of the wild grapevine of Georgia was Fr. A. Kollenati (1846).

Revaz Ramishvili investigated wildly growing grapevine of Georgia in the second half of 20 century. He has organized research expeditions almost in all regions of the country and collected about 400 genotypes in a field collection.

Based on investigation of the XX century a map for spreading of wild grapevine in Georgia in its 8 main centers of concentration has been singled out.

F. Ruprecht 1869
N. Sredinskii 1874
A. DeCandol 1885
I. Planschen 1887
V. Lipskii 1885
S. Timofeev 1892
G. Radde 1901
D. Sosnovskii 1925, 1946
N. Vavilov 1931
R. Ergesian 1946
R. Burkach-Abramovich 1953
M. Ramishvili, 1943, 1948, 1968
L. Pruidze 1966
E. Chamagua 1968
R. Ramishvili 1988, 2001
Maghradze and Failla (2022)

Investigation

Significance and Aim of the Research

Ninotsminda 11

Meneso 02

Investigation of wild grapevine has significant importance as:

1. An initial point for domestication of grapevine in the South Caucasus area 8.000 years ago and a probable a key for investigation of the process of domestication. Starting point for *Vitis vinifera* selection.
2. A plant under risk of extinction listed in the “Red Book” of Georgia.
3. An interesting plant for searching of genes for resistance or adaptation in the condition of global climate change.

- **The aim of** the research is:

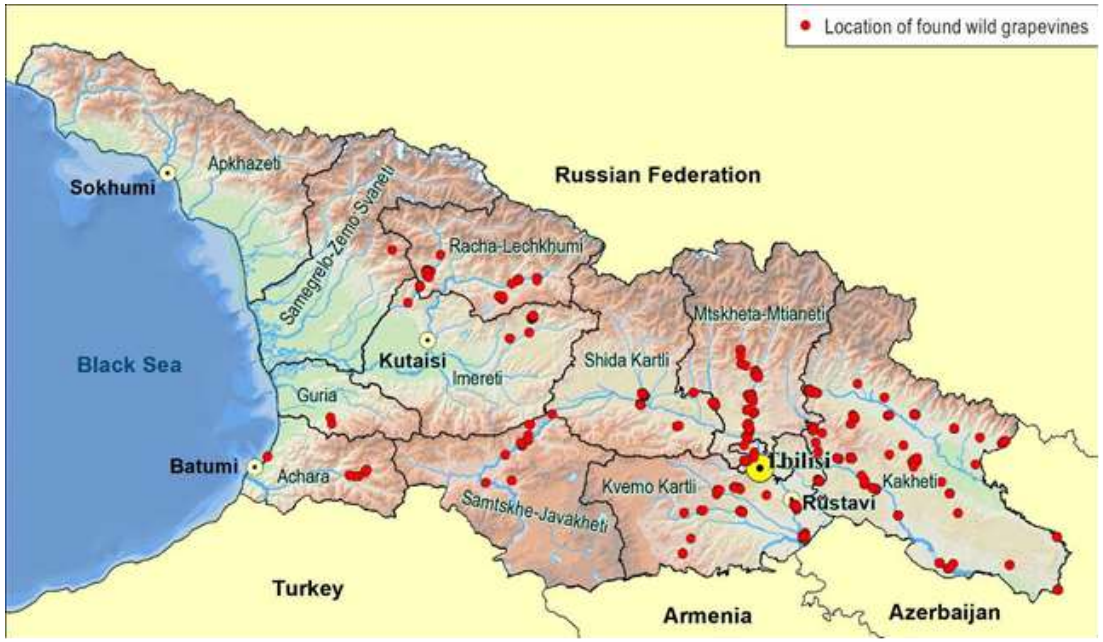
i) studying of the wild grapevine distribution in Georgia
ii) description the accessions preserved in the Jighaura field collection

The multidisciplinary research approaches were used including the methods of ampelography, biochemistry, agronomy, enology, molecular genetics and others.

Investigation

Investigation of *V. vinifera* ssp *sylvestris* Gmel.

The study was done based on expeditions in Georgia and mapping of the discovered plants since 2003

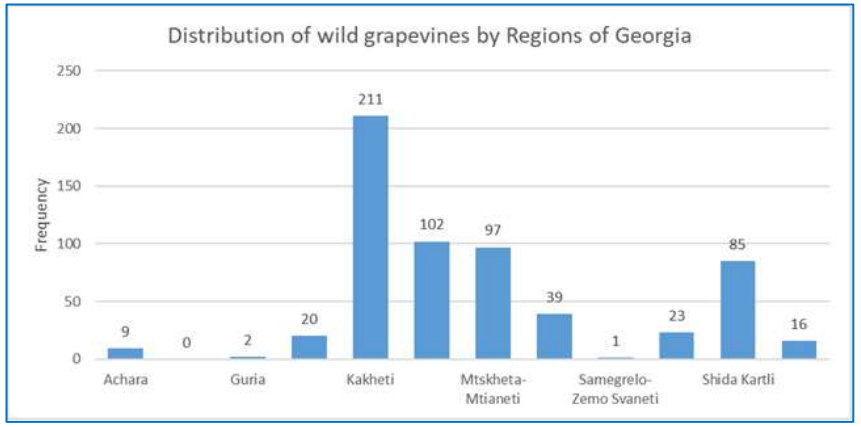


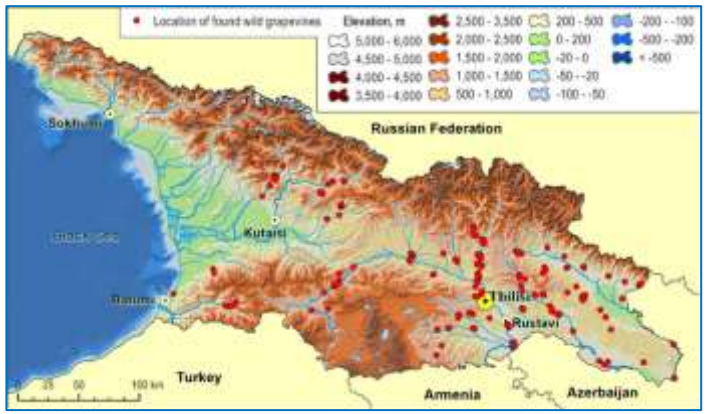
Map 1. Distribution by regions (2003-2021)

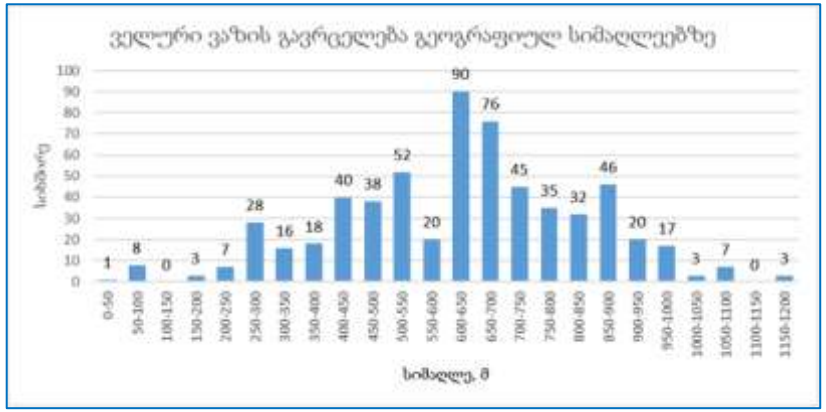
More than 300 genotypes have been discovered

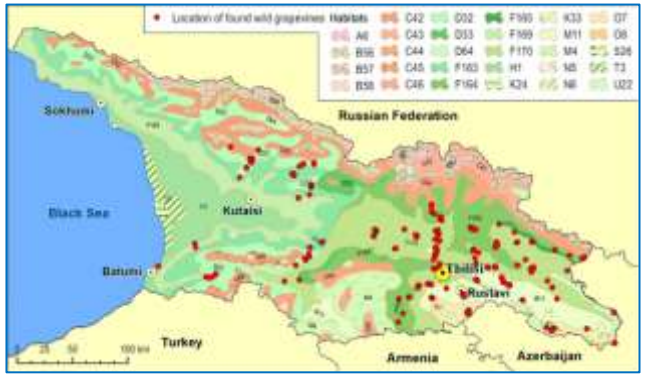
Investigation

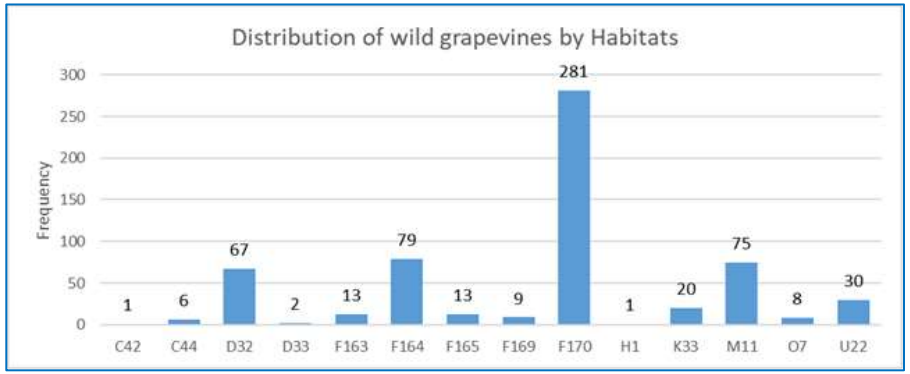
Investigation of *V. vinifera* ssp *sylvestris* Gmel. – Recent distribution





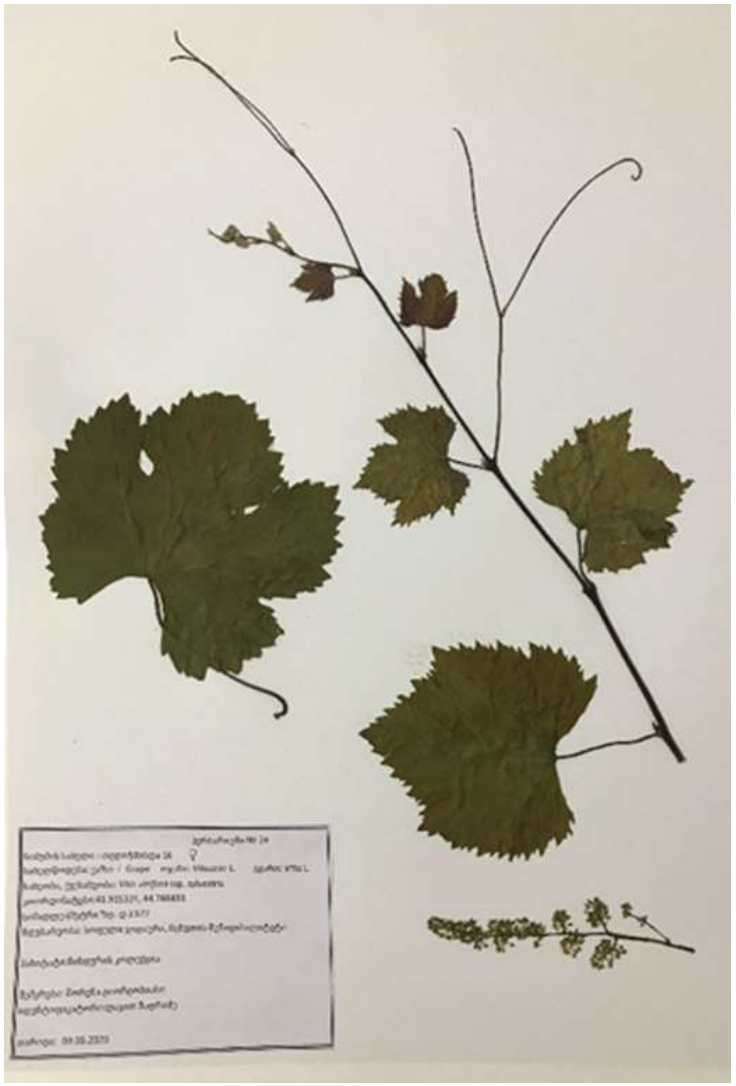






Conservation

Conservation of Wild grapevine *V. vinifera* ssp *sylvestris* Gmel.



The herbariums are describing the wild grape diversity

It was well-established a field collection in Jighaura experimental field of the SRCA.

In 2014 started establishment of a field collection of the wild grape, in which we started to accumulated discovered in nature genotypes.

Recently we have **70 genotypes** in it originated different part of our country.

Documentation

In the *Vitis* data bases

https://www.vivc.de

0 - TRUENESS_TO_TYPE	1 - INSTCODE = 7 characters	2 - ACCENUMB - Maximum field length = 25 characters	3 - COLLNUMB = 15 characters	4 - COLLCODE = 7 characters	5 - GENUS = 50 characters	6 - SPECIES = 70 characters	7 - SPAUTHOR = 50 characters	8 - SUBTAXA = 40 characters	9 - SUBTAUTHOR = 50 characters	10 - CROPNAME (Common crop name - utilization)	11 - ACCENAME (Accession name) = 50 characters	12 - ACQDATE (Acquisition date)	13 - ORIGCTY = 10 characters
yes, no, not checked, no reference, uncertain	Example: GRI051	Example: DEU056-1993-296	Example: PA90-110	Example: DEU056	Example: Vitis	Example: vinifera	Example: L.	Example: subsp. sylvestris		wine grape, table grape, raisin grape, rootstock, ornamental grape, wild grape	Example: Rülander	-Example: 1965---- -Example: 20020620	Example: ARM
yes	GEO038	GEO038-W2014-021	GEO038-W2014-021	GEO038	Vitis	Vinifera	L.	sylvestris	C.C. Gmel.	wild grape	Asuri01	2014	GEO
yes	GEO038	GEO038-W2014-006	GEO038-W2014-006	GEO038	Vitis	Vinifera	L.	sylvestris	C.C. Gmel.	wild grape	Bagichala 07	2014	GEO
yes	GEO038	GEO038-W2014-007	GEO038-W2014-007	GEO038	Vitis	Vinifera	L.	sylvestris	C.C. Gmel.	wild grape	Bagichala 04/05	2014	GEO
yes	GEO038	GEO038-W2014-010	GEO038-W2014-010	GEO038	Vitis	Vinifera	L.	sylvestris	C.C. Gmel.	wild grape	Bagichala 12	2014	GEO
yes	GEO038	GEO038-W2014-031	GEO038-W2014-031	GEO038	Vitis	Vinifera	L.	sylvestris	C.C. Gmel.	wild grape	Barisakhos gadasakhvevi	2014	GEO
yes	GEO038	GEO038-W2014-034	GEO038-W2014-034	GEO038	Vitis	Vinifera	L.	sylvestris	C.C. Gmel.	wild grape	Chachkhiriela 01	2014	GEO
yes	GEO038	GEO038-W2014-049	GEO038-W2014-049	GEO038	Vitis	Vinifera	L.	sylvestris	C.C. Gmel.	wild grape	Chqani02	2014	GEO
yes	GEO038	GEO038-W2014-052	GEO038-W2014-052	GEO038	Vitis	Vinifera	L.	sylvestris	C.C. Gmel.	wild grape	Chqani03	2014	GEO
yes	GEO038	GEO038-W2014-040	GEO038-W2014-040	GEO038	Vitis	Vinifera	L.	sylvestris	C.C. Gmel.	wild grape	Chqani04	2014	GEO
yes	GEO038	GEO038-W2014-045	GEO038-W2014-045	GEO038	Vitis	Vinifera	L.	sylvestris	C.C. Gmel.	wild grape	Chqani06	2014	GEO
yes	GEO038	GEO038-W2014-009	GEO038-W2014-009	GEO038	Vitis	Vinifera	L.	sylvestris	C.C. Gmel.	wild grape	Dda106	2014	GEO

http://www.eu-vitis.de/index.php

GEO38-Jighaura

GEO36-Shumi

- Jighaura collection (GEO38) – 70 samples
- Shumi winery collection (GEO36) – 10 samples

Characterization

Description of wild grapevine in the collection

Ampelographic Description:

41 genotypes were described by ampelographic methods and the ampelographic cards in English and Georgian languages were produces in Jighaura (Saguramo) field collection during 2018-2022.

These accessions represent 20 populations from Eastern and Western parts of Georgia.

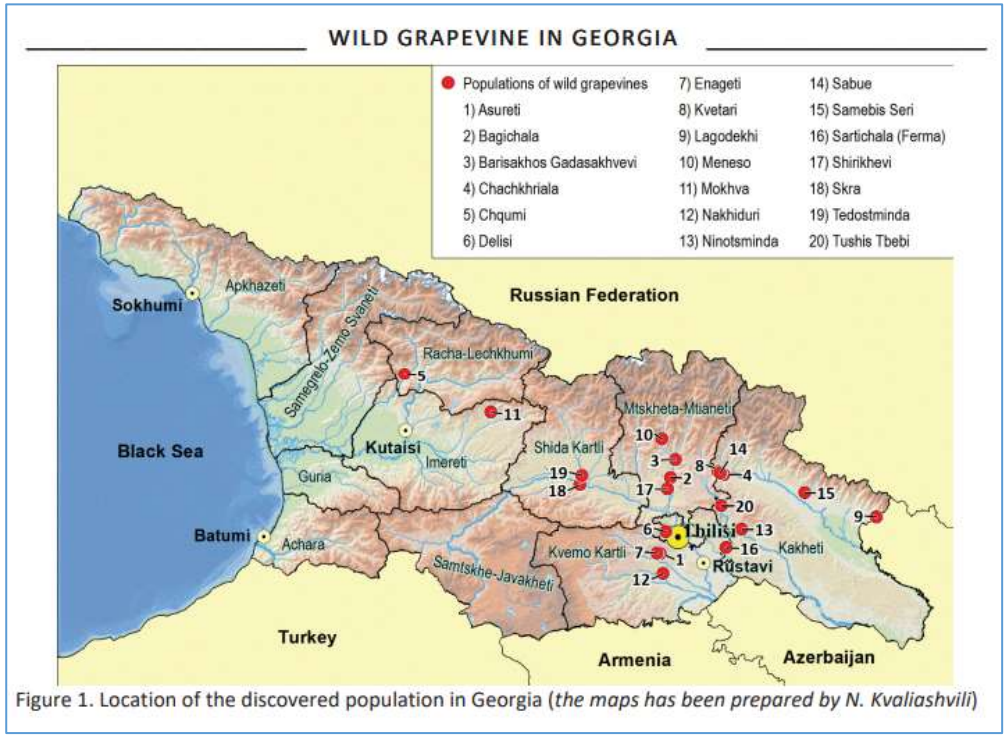
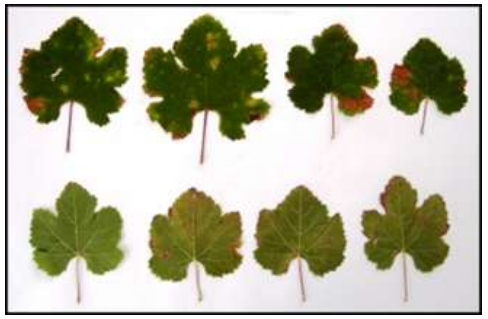


Figure 1. Location of the discovered population in Georgia (*the maps has been prepared by N. Kvaliashvili*)



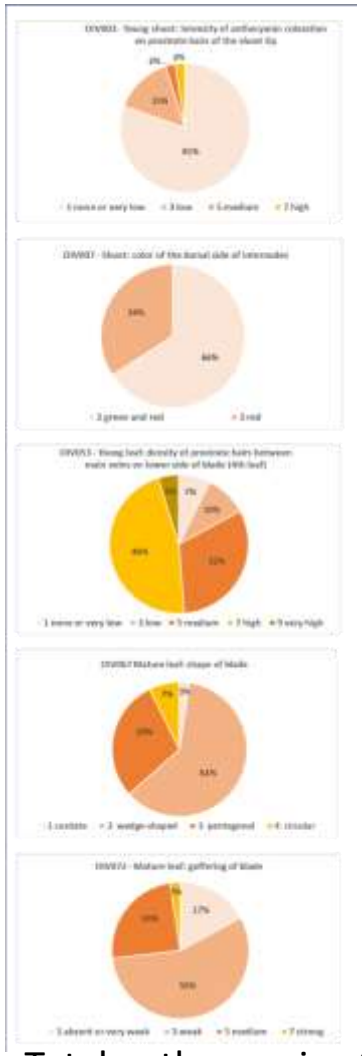
კრიჟანა ვაზის ნიმუში	რეპროდუქციული ორგანო	მუნიციპალიტეტი
ასურეთი 01	M	თეთრიწყარო
ბაგიჭალა (ბოინი) 07	M	დუშეთი
ბაგიჭალა 04/05	M	დუშეთი
ბაგიჭალა 12	M	დუშეთი
ბარისახოს გადასახვევი	F	დუშეთი
დელისი 06	M	თბილისი
ენაგეთი 01	M	თეთრიწყარო
თედოწმინდა 03	M	გორი
თედოწმინდა 04	F	გორი
თედოწმინდა 16	F	გორი
თედოწმინდა 22	M	გორი
თედოწმინდა 23	M	გორი
თედოწმინდა 25	F	გორი
თუშის ტბები 01	M	საგარეჯო
კვეტარი 04	F	ახმეტა
კვეტარი 05 (2)	F	ახმეტა
ლაგოდეხი (მე-60 კმ) 03	F	ლაგოდეხი
მენესი 01	F	დუშეთი
მოხვა	F	საჩხერე
ნახიდური 02	M	ბოლნისი
ნახიდური 11	F	ბოლნისი
ნახიდური 15	F	ბოლნისი
ნინოწმინდა 01	F	ნინოწმინდა
ნინოწმინდა 02	F	ნინოწმინდა
ნინოწმინდა 06+07	M	ნინოწმინდა
ნინოწმინდა 11	M	ნინოწმინდა
ნინოწმინდა 15	F	ნინოწმინდა
საბუე 01	M	ყვარელი
საბუე 03	F	ყვარელი
სამების სერი 08	F	ყვარელი
სართიჭალა (ფერმა) 02	M	გარდაბანი
სართიჭალა (ფერმა) 07	M	გარდაბანი
სართიჭალა (ფერმა) 11	M	გარდაბანი
სკრა 01	F	გორი
შირიმყვი 03	M	მცხეთა-მთიანეთი
შირიმყვი 04	M	მცხეთა-მთიანეთი
წაჩხრიალა 01	F	ახმეტა
ჭყუმი 04	F	ცაგერი
ჭყუმი 02	M	ცაგერი
ჭყუმი 03	F	ცაგერი
ჭყუმი 06	M	ცაგერი

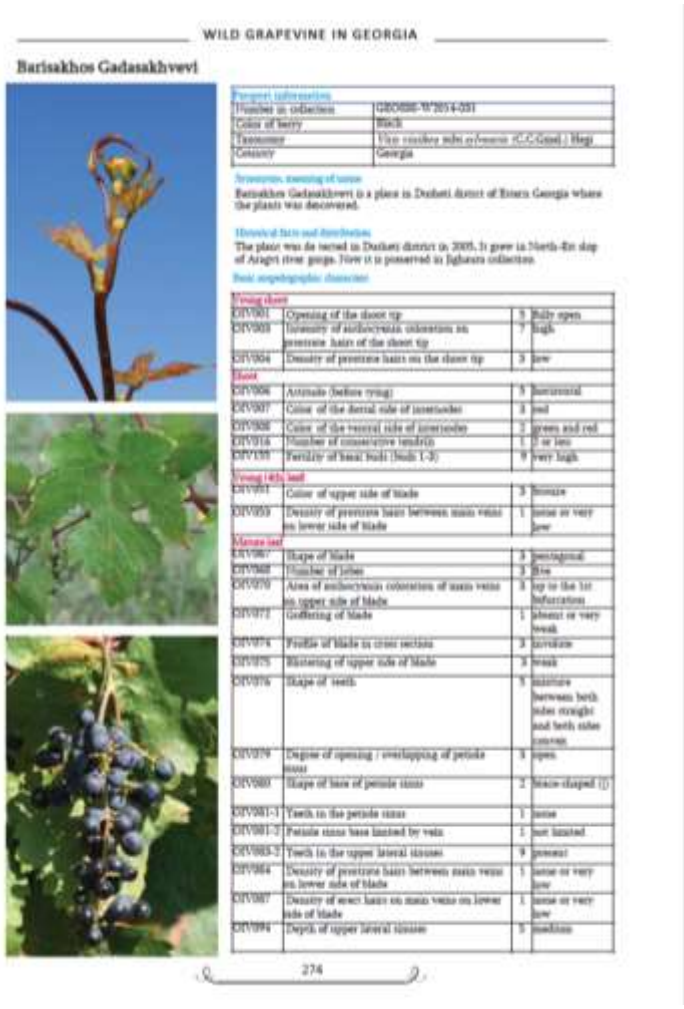
Characterization

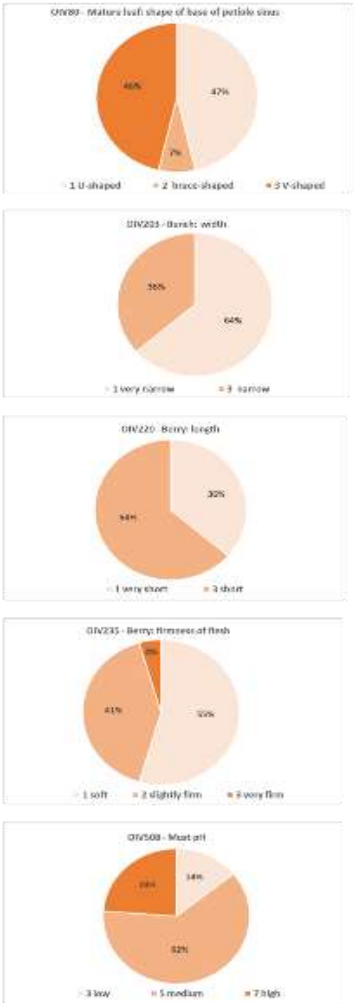
Description of the Wild grapevine *V. sylvestris* in the collection

Fifty two OIV Ampelographic descriptions, phonological records and Eno-carpological measurements was done and ampelographic cards were produced for 41 accessions from **Jighaura collection** in 2018 -2022.

It demonstrated that **8 descriptors are homogenous** and others are heterogeneous.





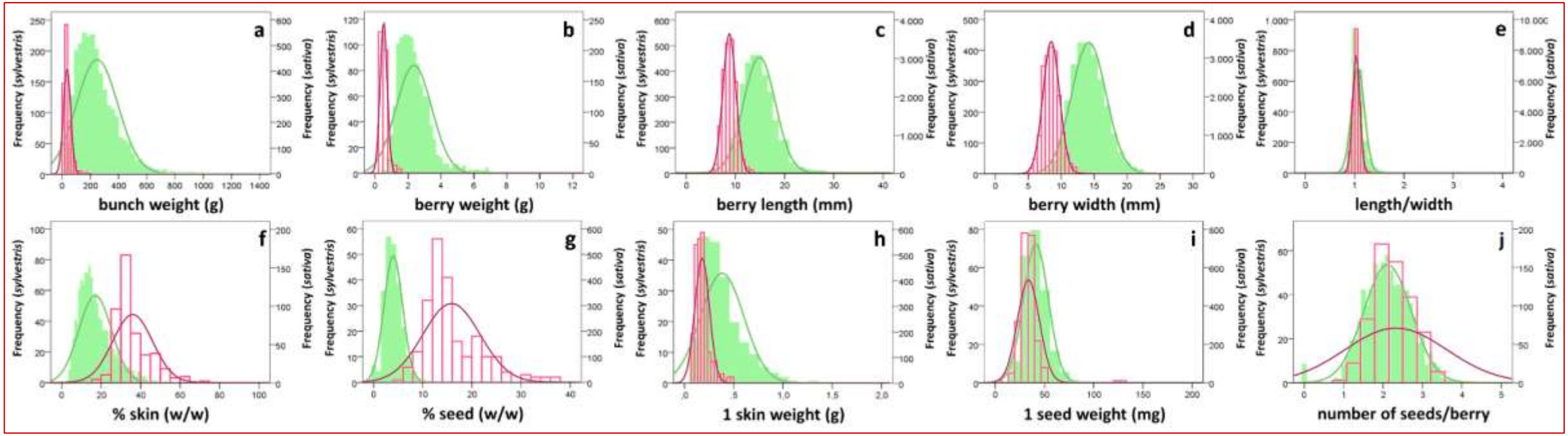


Total anthocyanin: 438 – 2118 mg/kg of grapes. Total polyphenols: 1187- 3358 mg/kg of grapes

Maghradze & Failla, 2022

Characterization

Comparison between wild and cultivated grapevine



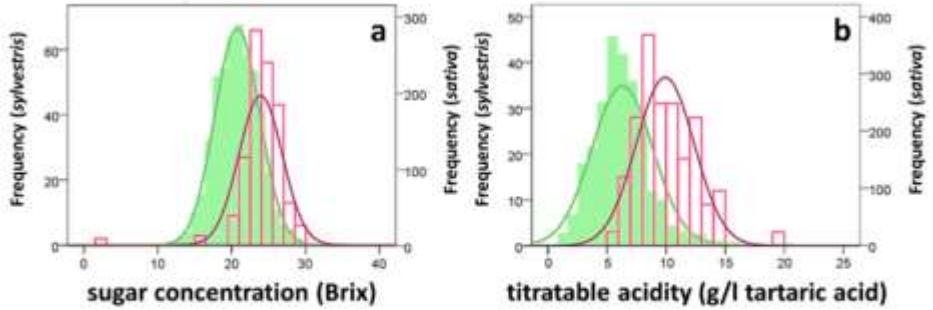
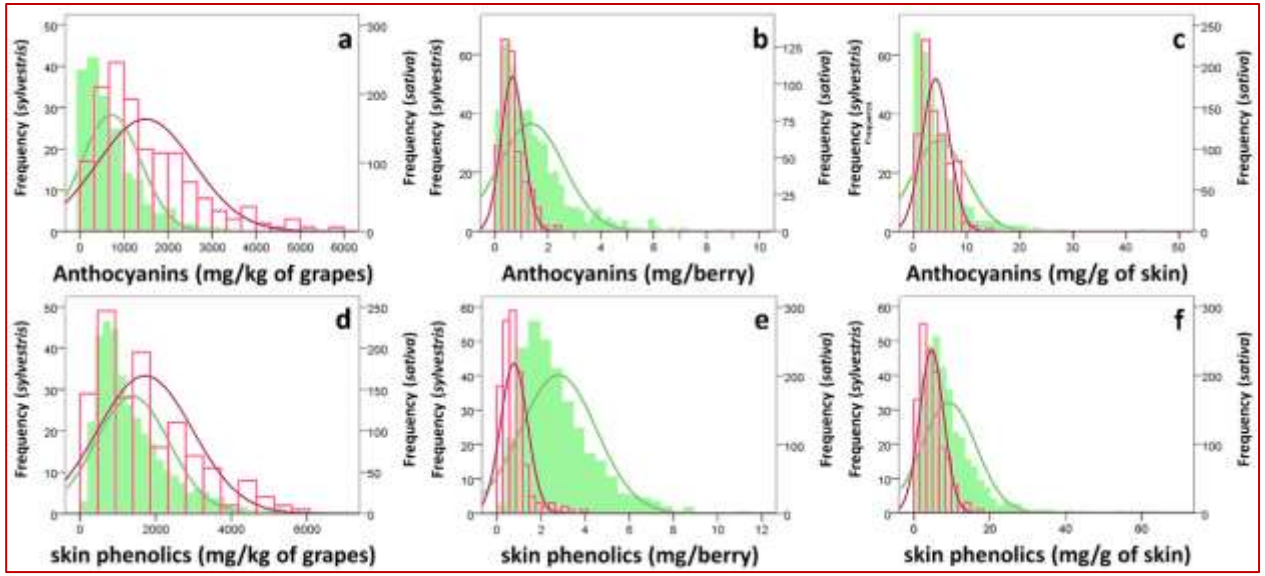


Figure 2. Technological parameters of the must of *Vitis vinifera* subsp. *sylvestris* (in pink) and subsp. *sativa* (in green). *Vitis vinifera* subsp. *sativa* data are already published in Rustioni et al. [26]. (**a**): sugar concentration (Brix), (**b**): titratable acidity (g/L tartaric acid).



sylvetsris – in pink

sativa – in green

Maghradze at al. 2021

Wine of the wild grape

Characterization

The aim:

- Evaluation of the composition of wines produced with wild and cultivated grapes
- Relevant interest of studying wines made from wild grapes in comparison to cultivated grapes.

Long-term goal

- increase the knowledge about wild grapes and wines
- evaluate the suitability and potentiality of wild grapes for wine production.

- *Years of harvest: 2017, 2018, 2019*
- *Vinifications were carried out by using the red winemaking method (with grape skin maceration)*
- *A fixed protocol was followed for the winemaking till dryness*

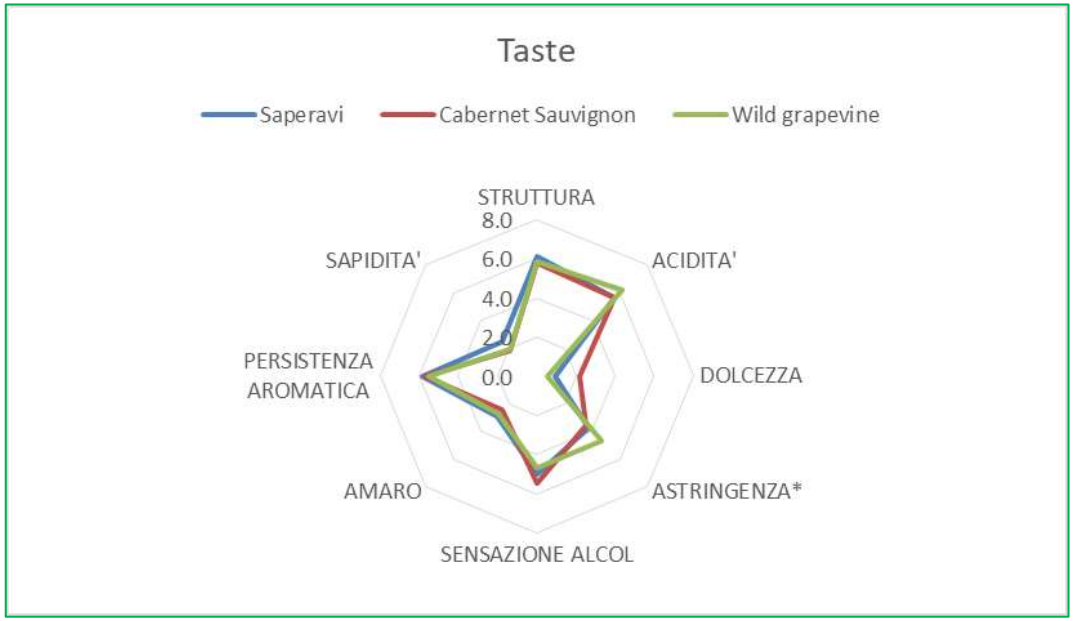
Composition of wine

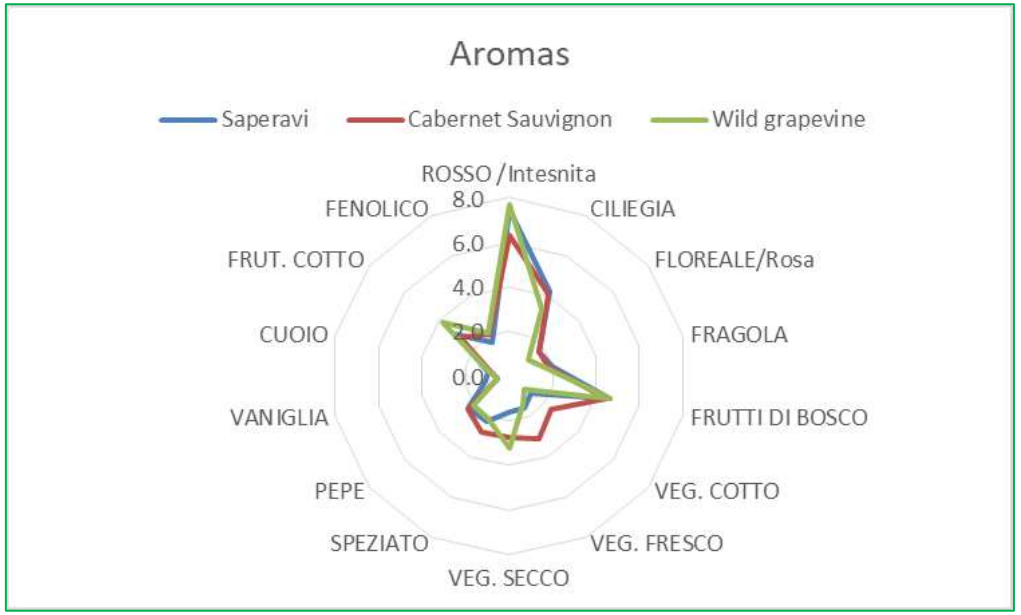
Wine	Wild Grape	Cabernet Sauvignon	Saperavi	Level of significance
Residual sugars (g/L)	3.0 ± 0.9 ^{a}	5.0 ± 4.5 ^{a}	1.9 ± 0.2 ^{a}	ns
Total acidity (g/L of tartaric acid)	7.1 ± 0.5 ^{a}	6.2 ± 0.2 ^{b}	7.2 ± 0.5 ^{a}	**
Volatile acidity (g/L of acetic acid)	0.5 ± 0.2 ^{a}	0.6 ± 0.1 ^{a}	0.6 ± 0.0 ^{a}	ns
pH	3.6 ± 0.0 ^{a}	3.3 ± 0.4 ^{a}	3.3 ± 0.2 ^{a}	ns
Ethanol (%, v/v)	14.2 ± 0.8 ^{a}	13.8 ± 1.0 ^{a}	13.7 ± 0.9 ^{a}	ns
Malvidin di-glucoside (mL/L)	2.5 ± 2.1	Not detected	Not detected	
Total phenol content (g/L of catechin)	3.1 ± 1.1 ^{a}	1.7 ± 0.4 ^{b}	1.7 ± 0.4 ^{b}	*
Total dry extract (g/L)	33.6 ± 3.7 ^{a}	31.4 ± 5.3 ^{a}	25.2 ± 1.9 ^{b}	*

Maghradze et al., 2021

Characterization

Wine sensorial evaluation



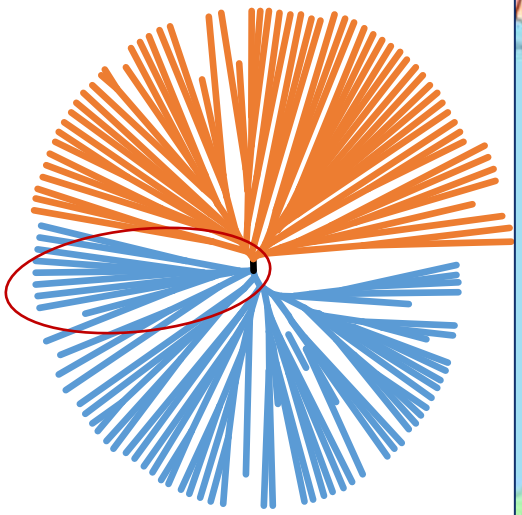


Color: dark cherry.
Aromas stand out: forest fruits, dried herbs, spices, berries, leather and black pepper.
Aromas weak: strawberry, vanilla and flower tones.
Tasting characteristics: high acidity, astringency, rough tannins, cheerful, lingering taste, minerality.
It is inferior to the wines of Saperavi and Cabernet Sauvignon

Characterization

DNA diversity linked to geography

Characterization by 20 SSR loci



112 varieties and 23 wild were studded

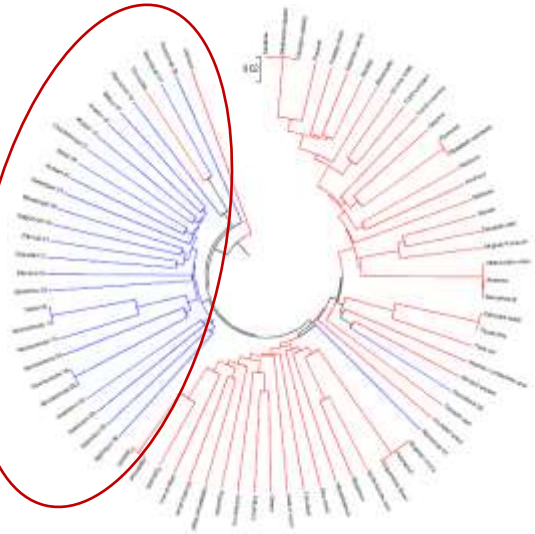
*UPGMA Dendrogram based on the Nei's genetic distance for **20 SSR loci***

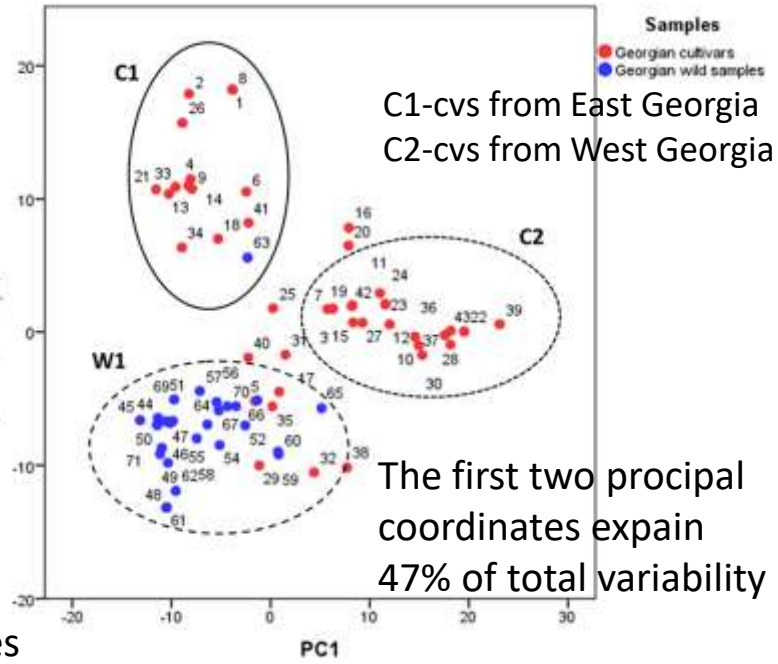
★ Most of the samples collected in this region belong to the red branced part of the dendrogram

☆ Most of the samples collected in this region belong to the blue branced part of the dendrogram

Imazio et al. 2013

Characterization by >10.000 SNPs

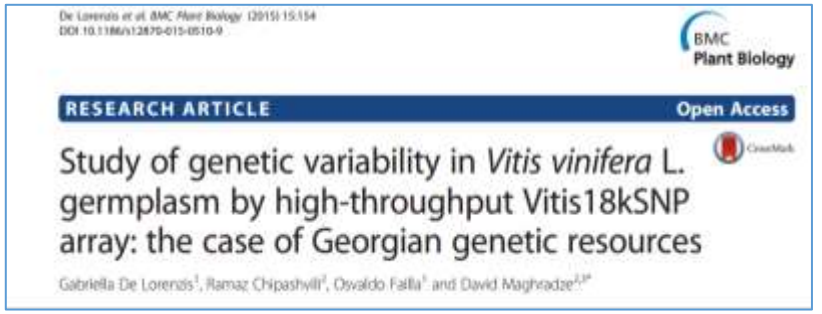




C1-cvs from East Georgia
C2-cvs from West Georgia

The first two procipal coordinates expain 47% of total variability

43 varieties and 28 wild grapes



De Lorenzis *et al.* 2015

Characterization

Characterization of Georgia varieties by >10.000 SNPs

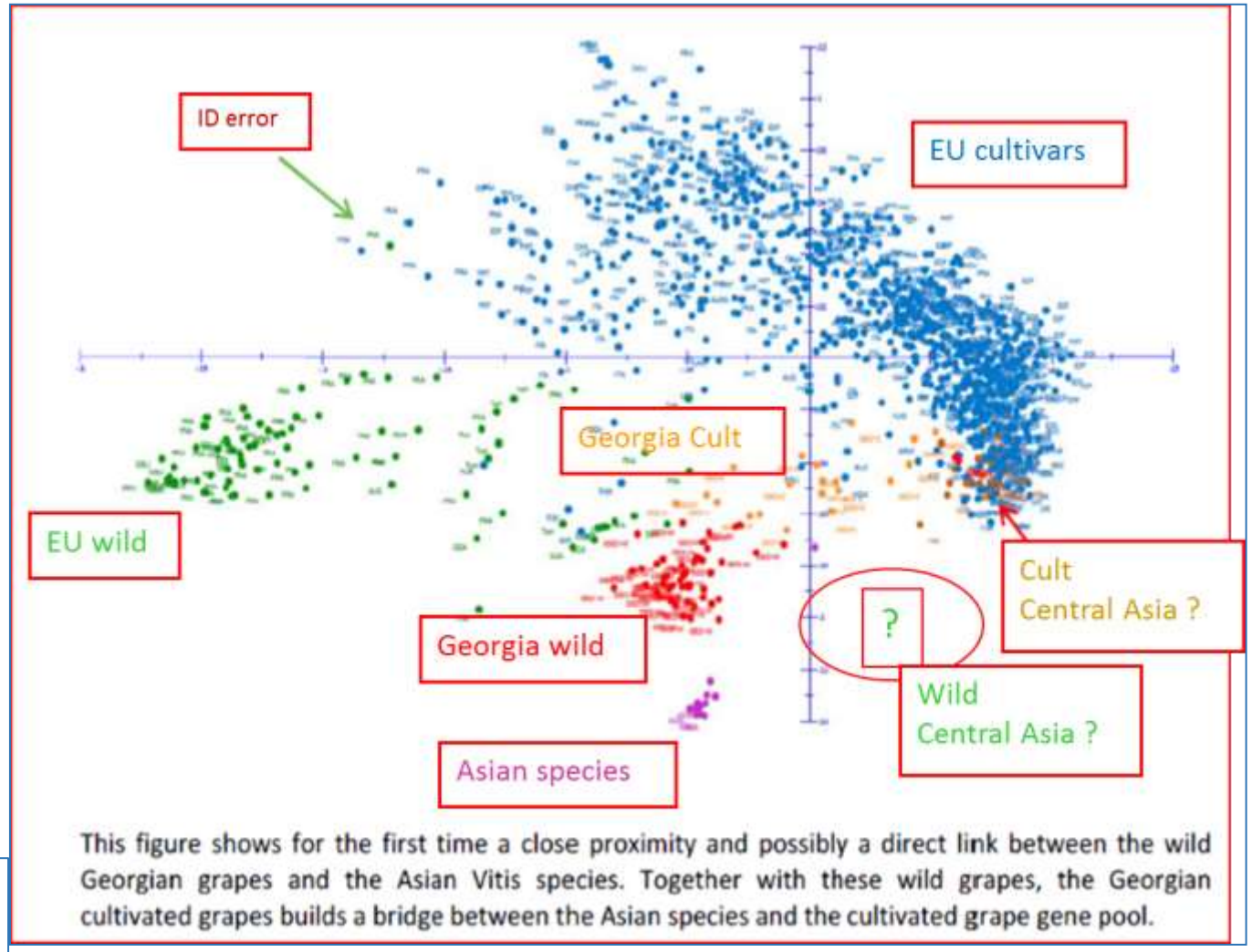
41 cultivated Georgians, 77 wild Georgians, 8 species, added by this project to 840 existing genotype profiles in INRA.

1st step: SSR profiles
2nd step: 10.000 SNP profiles
3rd step: PCA analysis

Georgian wild grapes are:
- true-to-type as related to their wild sub-species status.

- **Intermediary between Asian species and cultivated group**

European *V. sylvestris* genetic diversity is not sufficient to explain the cultivated gene pool diversity.
Georgian / Caucasian resources bridging the gap



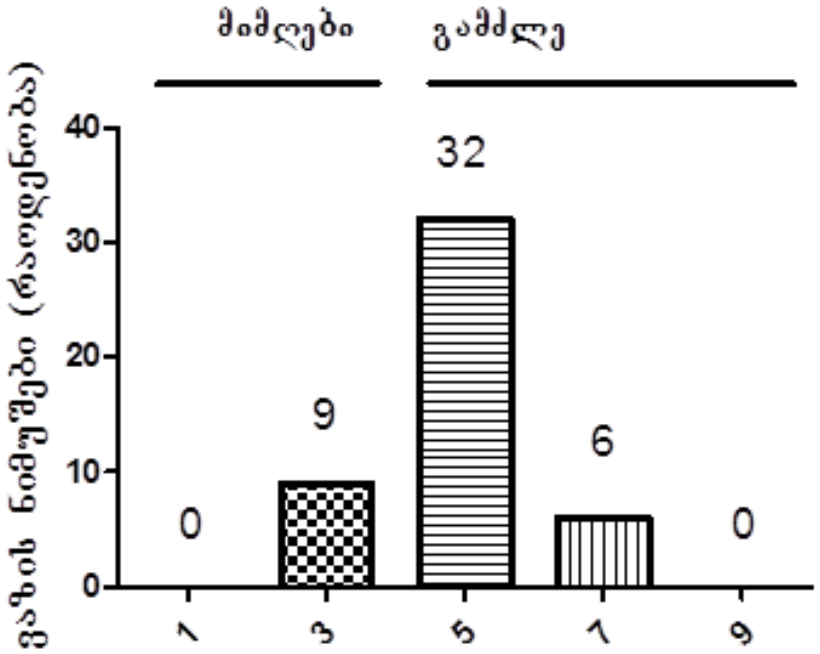
This figure shows for the first time a close proximity and possibly a direct link between the wild Georgian grapes and the Asian Vitis species. Together with these wild grapes, the Georgian cultivated grapes builds a bridge between the Asian species and the cultivated grape gene pool.

By R. Bacilieri, DAAV, INRA, France

Characterization

Degree of Resistance to *Plasmopara Viticola* (Downy Mildew)

OIV 452-1: Testing in the Lab (3 years data)



ცხრილი 1. ველური ვაზის ნიმუშების გამძლეობა ჭრაქის მიმართ

#	ნიმუში	სანერგე	ადგილობრ.	სქესი	OIV (225)	OIV(084)	OIV(087)	გამძლეობა				
								2018	2019	2020	2021	Final score
2	დელისი 01	b	(EG)+	F	Wt	1	3	5	3	3	3	3
3	დიდუმი 01	b	(EG)+	H	Wt	1	1	3	3	3	3	3
4	თედოწმინდა 22	a	(EG)+	M	BB	3	3	3		3	5	3
5	თედოწმინდა 25	a	(EG)+	F	NF	1	1		3		3	3
6	ნინოწმინდა 09	b	(EG)+	H	BB	1	1				3	3
7	სამების სერი 08	a	(EG)+	F	BB	3	1			3	5	3
8	სკრა 01	a	(EG)+	F	BB	3	3	3	5			3
9	ჩქუმი 03	a	(WG)+	F	BB	3	1	3		3	3	3
10	ჩქუმი 06	a	(WG)+	M	NF	3	1	3			5	3
11	ასურეთი 01	a	(EG)+	M	NF	3	3		5		5	5
12	ბაგიჭალა 12	a	(EG)+	M	NF	3	1				5	5
13	ბარისახოს გადასახვევი	a	(EG)+	F	BB	1	1	3		5	5	5
15	ზუბი 01	b	(WG)+	H	BB	3	1				5	5
16	თედოწმინდა 03	a	(EG)+	M	NF	1	5		5	7	5	5
17	თედოწმინდა 04	a	(EG)+	F		3	1		3	7	3	5
22	თედოწმინდა 16	a	(EG) -	F	BB	1	1	3		7		5
24	თედოწმინდა 22 (2)	b	(EG)+	F	Wt	1	1	3	3	7	5	5
25	თედოწმინდა 23	a	(EG)+	M	NF	3	3			7	7	5

Degree of resistance

1. Very susceptible: 0 accessions

3. Susceptible: 9 accessions

5. Medium resistant: 32 accessions

7. Very resistant: 6 (Bagichala 07, Enageti 01, Kvetari 05(2), Mokhva, Sabue 01, Tedotsminda 01)

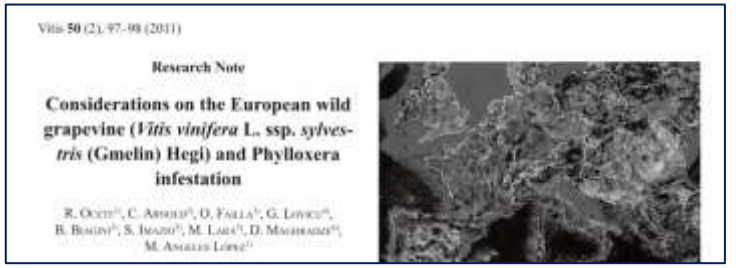
9. Very resistrant: 0 accessions

Wild Grape Research

Diversity

Phytophages and Pathogens

Root form of ***Phylloxera*** was not detected, while gals are evident on leaves of rootstocks in Georgia



Vitis 50 (2): 97–98 (2011)

Research Note

Considerations on the European wild grapevine (*Vitis vinifera* L. ssp. *sylvestris* (Gmelin) Hegi) and Phylloxera infestation

R. Ocete[1], C. Arnold[2], O. Failla[3], G. Lovics[4], B. Bagini[5], S. Imazio[6], M. Lara[7], D. Maghradze[8], M. Angeles López[1]

Mites (Acari, Eriophyidae):

- *Colomerus vitis* (Pagenstecher) – in abundunt
- *Calepitrimerus vitis* (Nalepa) – on half of plants

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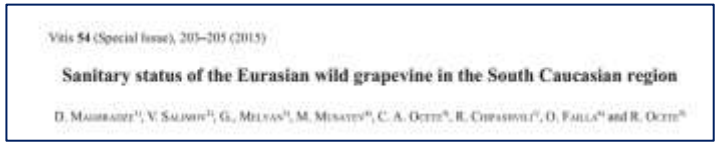
ISSN 1479-2621

Plant Genetic Resources: Characterization and Utilization (2012) 10(2): 132–142
doi:10.1017/S1479262112000160

Ecological and sanitary characteristics of the Eurasian wild grapevine (*Vitis vinifera* L. ssp. *sylvestris* (Gmelin) Hegi) in Georgia (Caucasian region)

Rafael Ocete Rubio[1], Elvira Ocete Rubio[1], Carlos Ocete Pérez[1], M. Angeles Pérez Izquierdo[1], Laura Rustioni[2], Osvaldo Failla[2], Ramaz Chipashvili[3] and David Maghradze[3,4]



Vitis 54 (Special Issue), 203–205 (2015)

Sanitary status of the Eurasian wild grapevine in the South Caucasian region

D. Maghradze[1], V. Salimov[2], G. Melyan[3], M. Musayev[4], C. A. Ocete[5], R. Chipashvili[1], O. Failla[6] and R. Ocete[5]

Powdery mildew – in all populations
Downy mildew – in all populations

Annals of Agrarian Science

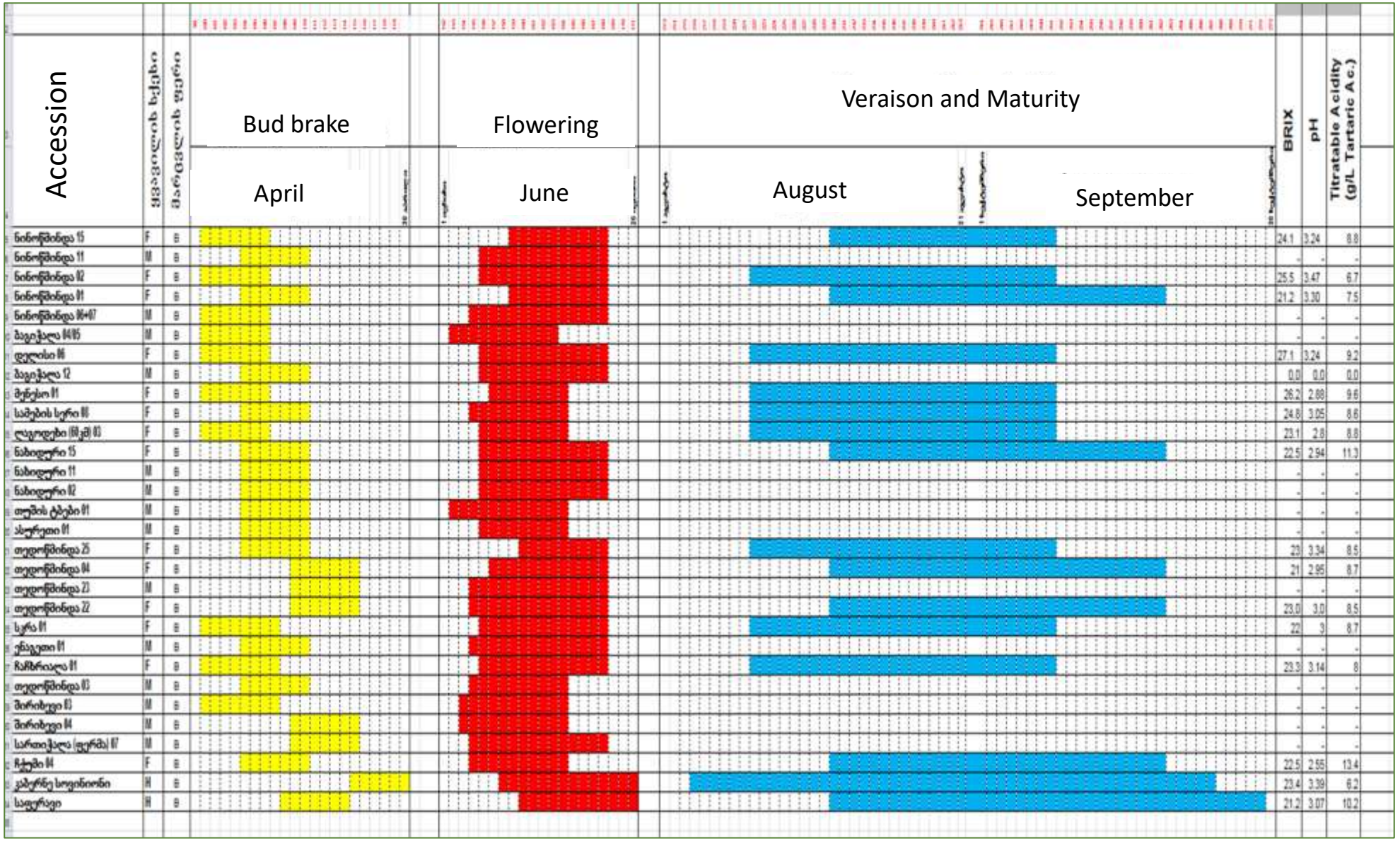
Support trees and shrubs for the Eurasian wild grapevine in Southern Caucasus

R. Ocete[a], D. Rivera[b], D. Maghradze[c,*], V. Salimov[d], G. Melyan[e], M. Musayev[f], C.A. Ocete[a], R. Chipashvili[d], O. Failla[b], C. Obón[a]

Diversity

Investigation of Wild grapevine *V. vinifera* ssp *sylvestris* Gmel.

Phenology: 28 wild genotypes and two cultivars were described based on the BBCH during 2019-2021



Science in Nat. & Int. projects

International and local projects studying grapes of Georgia

Bioversity International (2003-2008)

Conservation and sustainable use grapevine genetic resources in the Caucasus and Northern Black Sea Area

French ECO-NET (2006-2007)

Molecular characterization of grapevine genetic resources from the Caucasus

GrapeGen06 (2008 – 2011)

Conservation, characterization and management of grapevine genetic resources in Europe

GRAPENET (2010 – 2014)

East-West Collaboration for Grapevine Diversity Exploration and Mobilization of Adaptive Traits for Breeding

National Wine Agency, Georgia (2014 – 2024)

Research project for the study of Georgian Grape and wine culture

The European Vitis network (since 2003)

Wild Grapevine in Georgia: Research and Preservation (2019-2021)

(FR-18-18474)

Publications

Data Distribution

Year of Publication: **2022**

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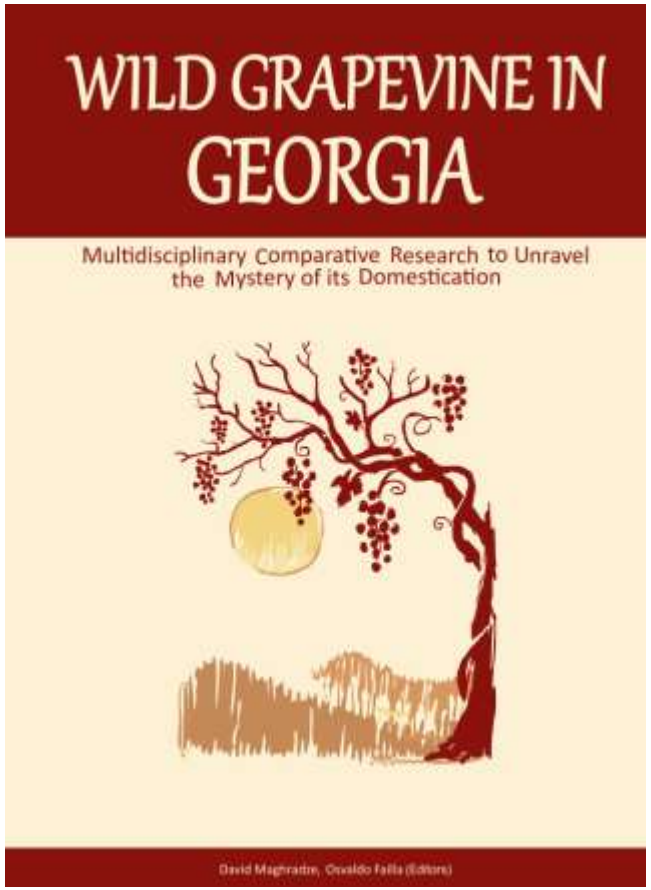

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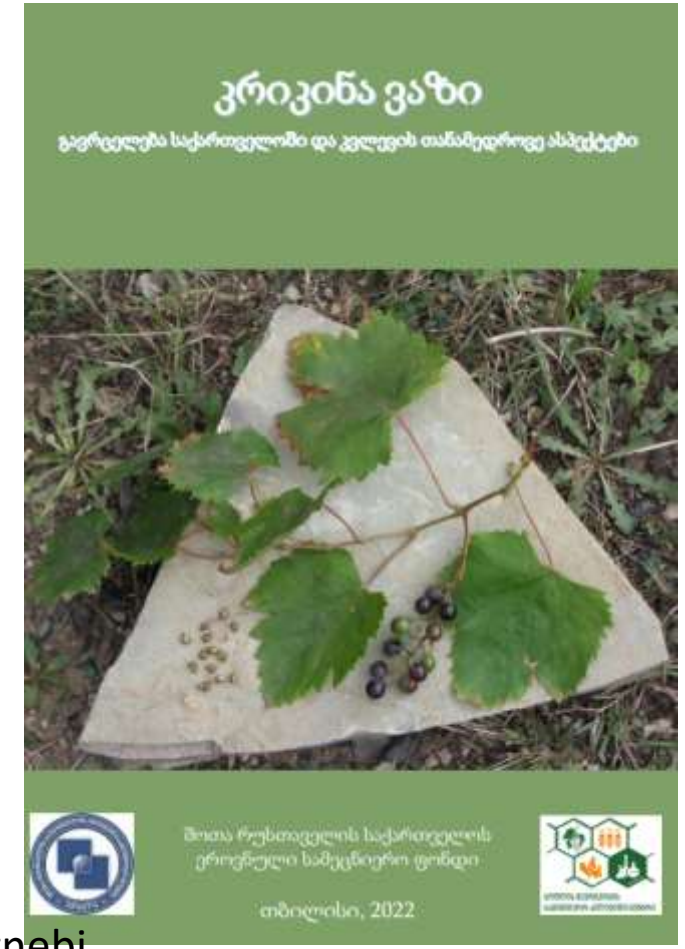

These books represents the anthologies of research works publishes by the members of our team on the theme of the wild grapevine in Georgia in the South Caucasus region in recent years

https://www.rustaveli.org.ge/geo/200916032128tsignebi

Thank You for Attention!

გმადლობთ ყურადღებისათვის!